Here's a **practical starter kit guide for building a small ESP32-based DIY drone**, including components, wiring, and setup tips.

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1 Suggested Components for an ESP32 Drone

Component	Notes / Recommendation
ESP32 board	ESP32 DevKit V1 or similar; 3.3V logic compatible
Brushless Motors (x4)	1806 or 2204 size for small quadcopters
ESCs (Electronic Speed Controllers, x4)	12A–20A for small motors
Propellers (x4)	5–6 inch; match motor specs
Battery	2S–3S LiPo, 500–1000 mAh for small drones
IMU sensor	MPU6050 or MPU9250 (I2C interface)
Frame	Lightweight quadcopter frame (plastic or carbon fiber)
Optional Wi-Fi / Bluetooth controller	Use ESP32's built-in wireless for remote control
Wires, connectors, soldering kit	For connecting ESCs, battery, and sensors

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2 Wiring Overview

ESP32 Connections

ESP32 Pin	Connected To
21 (SDA)	IMU SDA
22 (SCL)	IMU SCL
14	ESC Motor 1 PWM
27	ESC Motor 2 PWM
26	ESC Motor 3 PWM
25	ESC Motor 4 PWM
3.3V / GND	IMU VCC / GND
Vin / GND	Battery (through power distribution)

Notes:

- PWM pins can be any digital pins supporting PWM.
- IMU uses I2C, so SDA/SCL can vary depending on ESP32 board.

- Battery powers ESCs directly; ESP32 can get 5V from UBEC (built-in regulator from ESC) or separate regulator.

Motors & Propellers

- Connect **each ESC to a motor**.
- ESC receives PWM signal from ESP32 pin.
- Propellers attach to motor shafts (pay attention to clockwise/anticlockwise orientation).

IMU Sensor

- Connect **SDA/SCL to ESP32**.
- Connect **VCC to 3.3V** and **GND**.
- This sensor provides **orientation data (pitch, roll, yaw)** to stabilize the drone.

Battery & Power

- Battery powers **ESCs → motors**.
- Some ESCs have **5V BEC** → can power ESP32 directly.
- Always **check voltage limits** for ESP32 and ESCs.

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3 Software Setup

1. **Install Arduino IDE** or **PlatformIO**.
2. Add **ESP32 board support**:
   - Arduino IDE: Tools → Board → Boards Manager → search "ESP32" → install.
3. Use libraries:
   - `Wire.h` for I2C (IMU)
   - `ESP32Servo.h` or `PWM` for ESC control
4. Implement **PID control loop** for stabilization:
   - Read IMU data → calculate correction → adjust motor PWM → stabilize drone.

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4 Optional: Remote Control

- ESP32 Wi-Fi + Web interface or smartphone app
- Bluetooth controller via app
- For testing, manual PID tuning may be done via serial monitor.

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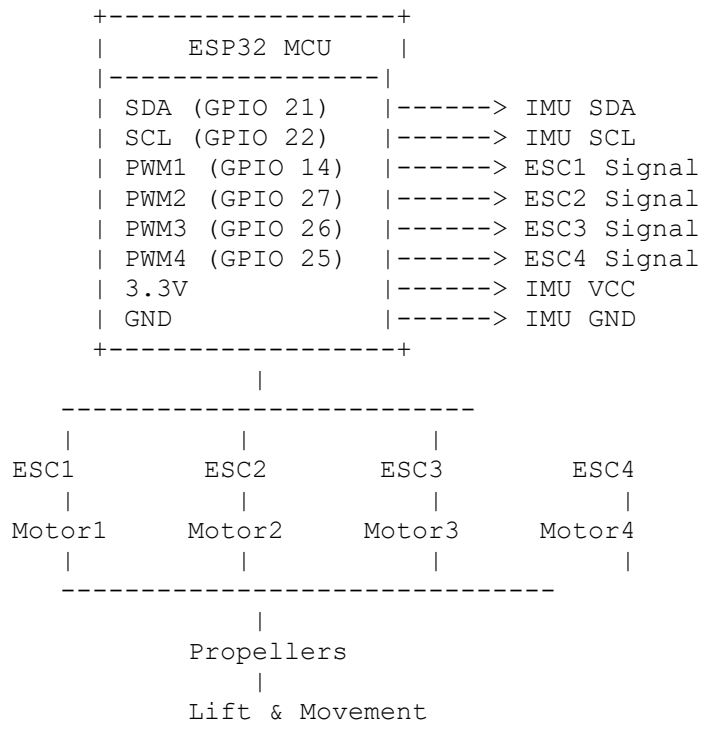
5 Safety Tips

- Always test **motors without propellers** first.
- Use **low-power battery** for initial testing.
- Fly in an **open area**.
- Secure all wires and connectors.

Here's a **detailed wiring diagram for an ESP32-based DIY quadcopter**, showing exactly how to connect the **ESP32 DevKit V1**, **IMU sensor**, **ESCs/motors**, and **battery**.

ESP32 Drone Wiring Diagram



Power Connections:
- **Battery (LiPo)** → connects to all ESCs power input
- **ESP32 power** → can be powered via 5V from one ESC with BEC or separate regulator
- **GND** → common ground for ESP32, ESCs, and IMU

Step-by-Step Notes

1. **IMU Sensor (MPU6050/9250)**
   - Connect SDA → GPIO21, SCL → GPIO22
   - VCC → 3.3V, GND → GND
2. **ESCs & Motors**
   - Signal wires → ESP32 GPIO pins (14, 27, 26, 25)
   - ESC power → directly from LiPo battery
   - Motor wires → connect to ESC output
3. **Battery**
   - Provides high current to ESCs/motors
   - ESP32 gets 5V from ESC BEC or separate step-down regulator
   - **Always connect a common ground**
4. **Optional Wi-Fi/Bluetooth**
   - ESP32 has built-in wireless for remote control, telemetry, or smartphone interface

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Tips for DIY Drone

- Test motors **without propellers** first.
- Ensure correct motor rotation (2 CW + 2 CCW) for stability.
- Tune **PID controller** carefully for smooth flight.
- Keep wires neat to avoid interference with propellers.